for the first time since 1945 a sharp reaction against militarism, is it inevitable that public support of universities should also be declining?

Hilbert possessed a robust common sense which allowed him to see the folly of wars of national aggrandizement and still remain a patriotic German. Politically, his finest hour came in October 1914. The German government then published a Declaration to the Cultural World in which the leaders of German science and art and literature were invited to proclaim their support for the German war machine. Among other dubious statements, the Declaration said: "It is not true that Germany violated the neutrality of Belgium." At a time of intense nationalistic hysteria, to refuse to sign the Declaration was in many people's eyes an act of treason. Almost all the Germans of international repute, including Röntgen and Planck, signed. Of the leading scientists, only Einstein and Hilbert refused.

The catastrophe of 1933 found Hilbert already retired and too old to comprehend fully what was happening. "The so-called Jews are so attached to Germany," he said at that time, "but the rest of us would like to leave." He did not leave, but stayed in Göttingen to the bitter end, a relic of past glory. Of his vast circle of brilliant pupils and friends, only Sommerfeld, a relic like himself, remained to stand at his grave.

The author says in the preface that the book was "to a large extent written from memory." By this she means that she has mined the memories of the many people still alive who have been colleagues of Hilbert's or wives and children of colleagues. Looking at her list of sources, it is hard to think of any important witness that she has not successfully contacted. In addition, she has researched all the surviving correspondence and public records that have any bearing on Hilbert's life. As a work of historical scholarship, this biography maintains a consistently high level of critical accuracy. Hilbert is shown as he was, warts and all.

But the book is much more than a piece of conventional historical research. Beyond this, it is a poem in praise of mathematics. It brings to life through the many-sided personality of Hilbert the struggles and glories of mathematical creation, giving birth to the purest and most durable works of art that the spirit of man has yet produced.

FREEMAN DYSON
Institute for Advanced Study, Princeton, New Jersey

Inorganic Preparations

The Synthesis and Characterization of Inorganic Compounds. WILLIAM L. JOLLY. Prentice-Hall, Englewood Cliffs, N.J., 1970. xiv, 594 pp., illus. $15.95. Prentice-Hall International Series in Chemistry.

To those who are familiar with the author's contributions to synthetic inorganic chemistry the excellence of this book will come as no surprise. There is no comparable book available in inorganic chemistry, and this one will rapidly assume the position of a standard text. The book is far more than a revision of the author's previous monograph on the subject, *Synthetic Inorganic Chemistry* (Prentice Hall, 1960), although the themes developed in that work have been utilized more effectively in this volume.

The book falls naturally into four sections. The first section, which assumes a knowledge of thermodynamics and kinetics, shows quite clearly the application of these subjects to synthetic chemistry. The second is concerned with the techniques available and utilized in preparative chemistry. This section quite naturally varies widely in amount and level of presentation. The author seems, wisely, to have chosen to survey some areas critically and to concentrate on those subjects concerning which information is not so readily available, rather than to compete with other well-known texts. The third section deals with structural characterization; here again the author undertakes a critical survey with numerous well-chosen examples rather than an exhaustive review of each technique. The last section is a truly representative set of inorganic preparations chosen to illustrate not only the techniques and principles outlined in the previous chapters but, more importantly, the diversity of preparative inorganic chemistry. In addition to accounts of the preparations described in *Synthetic Inorganic Chemistry*, all of which have been rewritten and improved, in some cases substantially, this section contains detailed descriptions for the preparation of some 50 compounds. Considerable emphasis is also placed on adequate characterization of the materials when obtained. I was particularly struck by the organization of this section into types of operations and classes of compounds rather than a random list of increasingly difficult experiments.

The text is exceptionally well referenced and well illustrated with drawings and diagrams and contains a large number of useful tables. A feature I found particularly attractive is the large number of problem sets contained in the various sections.

I think that the author has lived up to the objectives he stated in the preface and the book will be "a useful reference guide for all experimental chemists."

ALAN DAVISON
Department of Chemistry, Massachusetts Institute of Technology, Cambridge

Semiconductor Technique

Current Injection in Solids. MURRAY A. LAMPERT and PETER MARK. Academic Press, New York, 1970. xiv, 354 pp., illus. $18. Electrical Science series.

The literature on current injection in solids is very extensive, and it is therefore enormously beneficial to scientists or engineers engaged in research in semiconductor physics to have available to them a lucid and comprehensive book on the subject. The conduction of electricity in semiconductors or insulators is frequently nonohmic, and it is not always easy to separate out the various effects that produce such behavior. One set of such effects results from carrier injection, usually from the contacts, leading to a disturbance of the carrier concentration in thermal equilibrium. Majority and minority carriers, together or separately, may be injected and can then give rise to unusual current-voltage relations and field distributions within the solid. An understanding of the field is, however, desirable not merely for the purpose of unraveling nonohmic behavior phenomena. As the authors point out repeatedly, carrier injection can be used as a tool to study the solid itself. Examples abound in the book, but just two of them will suffice to illustrate the point. From experiments with single-carrier space-charge-limited currents it is possible to gain information about trap densities and energies. From single-carrier drift experiments it is possible to measure mobilities in solids (usually films) which do not lend themselves to steady-state, thermal-equilibrium determinations of mobility.

The book is admirably organized and lucidly written. The theoretical treatment is always carefully broken down into approximate and analytical sections. Uniform treatments are also fre-

quently avoided at the outset in order to bring out the physical differences between limiting cases. Thus, the separate treatment of double injection into insulators and semiconductors is very welcome. Attention is also paid to the role of contacts and current-flow geometry. The experimental data in the field are well covered, and the breakdown into different materials is very welcome. Of particular interest in connection with double-injection phenomena is the frequent occurrence of current-controlled negative resistance characteristics. The authors give the theory of such a mechanism, brought about by the combination of double-injection and trapping effects, but they also give examples of other mechanisms that can produce a negative resistance. A mild criticism of this part of the book is that rather brief attention is paid to the question of current filament formation, which, according to some authors, always sets in when such a negative resistance device is switched from its high voltage threshold to its low voltage state.

As a reviewer who is not a specialist in the field but has some familiarity with the subject I found the book very instructive and useful, and can highly recommend it to a broad audience of semiconductor scientists.

K. WEISER

Thomas J. Watson Research Center, International Business Machines Corporation, Yorktown Heights, New York

Chemical Analysis

Topics in Organic Mass Spectrometry. A. L. BURLINGAME, Ed. Wiley-Interscience, New York, 1970. xii, 472 pp., illus. $22.50. Advances in Analytical Chemistry and Instrumentation, vol. 8.

The goal of the editor of this volume is to assess current areas of active research in mass spectrometry, a task that is exceedingly difficult because of the rapid progress that is being made in this field. The latest reference I found in this book was 1968, and one chapter's most recent reference was 1965. Thus, I feel that the editor has not achieved his goal. The time lag is very apparent in the chapter on combined gas-liquid chromatography and mass spectrometry, where the authors claim that in the time-of-flight mass spectrometer differential pumping between the ion source and the drift tube is not possible and that there are no data available regarding the performance of gas chromatographs coupled to quadrupole mass spectrometers.

On the positive side, the editor has assembled an impressive array of authorities on various aspects of mass spectrometry, and the book achieves a good balance between the principles and the applications of mass spectrometry.

The first chapter is an excellent discussion of the various methods of ionization employed in the study of organic materials. The authors (Becky and Comes) have presented a readable account of the strong and weak points of the various approaches to ionization, particularly field ionization. I had hoped that this chapter would devote more discussion to comparison of field and chemical ionization than to comparison of field and electron-impact ionization. The former pair is employed by many more organic chemists to obtain the same type of information (identity of the molecular-weight or quasi-molecular-weight ion) than the latter pair.

The second chapter, by la Lau, provides an excellent discussion of some factors of which many organic chemists using mass spectrometers are unaware, namely, discrimination at the electron multiplier. On page 109 la Lau appears to have mixed his usage of the symbols γ_r and γ_{ri}. The chapter by Harrison presents an interesting approach to fragment ion structures—the use of ion energetics. I take issue with Harrison on several points, however. First, the statement on page 125 that appearance potentials are identified with enthalpy changes (ΔH) does not make clear to a novice the assumptions employed when appearance potentials are used as heats of reaction. The appearance potential is defined as ΔE, and since $\Delta(PV)$ can be assumed negligible for these gas phase reactions, appearance potentials may be assumed equal to heats of reaction. Also, it is assumed in the use of the tabulated standard heats that ΔH is essentially temperature-independent. Many ion sources are operated at elevated temperatures (250°C), but the tabulated ΔH values are given for 25°C. Second, Harrison discusses, on page 139, the need to know the path of the ionic reaction for the determination of the ionic heat of formation. When one is using appearance potentials as heats of reaction, only the identity of the original compound and products, both ionic and neutral, and their heats of formation are required to determine the heat of formation of an ion. The chapters by Bieman, McLafferty, MacFadden and Buttery, and Schnoes and Burlingame give excellent accounts of research in the various areas of organic mass spectrometry and are to be recommended.

This volume is readable, although not too current, and would be of use to a chemist not engaged in mass spectrometry research.

F. E. SAALFELD

Chemistry Division, Naval Research Laboratory, Washington, D.C.

Books Received

Advances in Applied Microbiology. Vol. 12. D. Perlman. Academic Press, New York, 1970. xviii, 322 pp., illus. $16.50.

Advances in Biology of Skin. Vol. 10, The Dermis. Proceedings of a symposium, Gleneden Beach, Oregon, 1968. William Montagna, J. Peter Bentley, and Richard L. Dobson, Eds. Appleton-Century-Crofts (Meredith), New York, 1970. xviii, 302 pp., illus. + plates. $18.50.

Advances in Enzyme Regulation. Vol. 8. Proceedings of a symposium, Indianapolis, September 1969. George Weber and Catherine E. Forrest Weber, Eds. Pergamon, New York, 1970. xvi, 390 pp., illus. $18.75.

Advances in Microwaves. Vol. 5. Leo Young, Ed. Academic Press, New York, 1970. xiv, 318 pp., illus. $17.50.

Advances in Teratology. Vol. 4. D. H. M. Woollam. Academic Press, New York, 1970. 240 pp., illus. + plates. $15.

Ancient Astronomical Observations and the Accelerations of the Earth and Moon. Robert R. Newton. Johns Hopkins Press, Baltimore, 1970. xx, 310 pp., illus. $10.

Annual Review of Biochemistry. Vol. 39. Esmond E. Snell, Paul D. Boyer, Alton Meister, and R. L. Sinsheimer, Eds. Annual Reviews, Palo Alto, Calif., 1970. xii, 1136 pp., illus. $13.

The Archaeology of Summer Island. Changing Settlement Systems in Northern Lake Michigan. David S. Brose. University of Michigan, Ann Arbor, 1970. viii, 238 pp., illus. + plates. Paper, $3.

Astronomy and Astrophysics Abstracts. Vol. 2, Literature 1969, Part 2. S. Böhme, W. Fricke, U. Güntzel-Lingner, F. Henn, D. Krahn, and G. Zech, Eds. Published for Astronomisches Rechen-Institut by Springer-Verlag, New York, 1970. x, 516 pp. $19.80.

Behavior. A Systematic Approach. Joseph M. Notterman. Random House, New York, 1970. xiv, 370 pp., illus. $8.

The Behavior Change Process. Oscar G. Mink. Harper and Row, New York, 1970. xii, 212 pp., illus. Paper, $3.95. Reprint of the 1968 edition.

The Big Machine. Robert Jungk. Translated from the German edition (1966) by